NOTES ON *BYBLIS GIGANTEA*, Lindl. [N.O. *Droseraceæ*].

By A. G. Hamilton.

(Plate xxxvii.)

During a recent visit to West Australia I took the opportunity of seeing Byblis in its natural habitat. Although very numerous in individuals where it does occur, it appears to be restricted to certain localities; and so far as I could ascertain, the occurrence of the plant is determined by well-marked peculiarities of soil. Near Perth I found it most plentiful on the Woodlupin Road, near Cannington, and I was indebted to Mr. H. C. Prinsep, Chief Protector of Aborigines, for an opportunity of visiting the spot. The plant grows on a swampy flat of whitish clay and sand of a very infertile appearance, and its want of fertility was borne out by the fact that almost the only plants flourishing there were Byblis and a fine species of Drosera. The swamp, which was some acres in extent, was surrounded by soil of a rather better character, and on this were many trees and shrubs, mostly Proteaceous and Myrtaceous. The boundaries of the swamp were sharply defined by the line of better and more luxuriant vegetation surrounding it. From information given me by some of the Perth botanists, I believe that Byblis grows only where the soil is similar to that of this swamp—deficient in nitrogenous matter; and that its habits are directly adapted to procuring that necessary material.

On the flat in question both Byblis and Drosera were individually very plentiful. Facing westward when the sun was low, they were a beautiful sight. The Drosera growing to a height of 12-18 inches, and branching freely, had either bright golden-yellow or crimson leaves, translucent and gemmed plentifully with diamond-like drops of secretion. The Byblis plants, though equally plentiful, had leaves too thick for the light to shine

through, but each stem and leaf bordered with a shining silvery halo from the drops of liquid on the glands.

The plant is usually about 15 inches in height, but I noticed several of 20 to 25 inches. The stem is stout and branching. The plant is greenish-yellow in all its parts, save that in young leaves about 1½ inches of the tip is crimson. The leaves vary from 4 to 8¾ inches in length, and are three-sided, but with the angles rounded, and bearing a round knob at the apex. The flower is large, bright magenta in colour, the bright yellow anthers forming a striking contrast. At a distance it reminded me of *Cheiranthera linearis* in shape and coloration. Examined more closely, it bears little resemblance to the more open cup-shaped flowers of the Droseraceæ generally. A specimen with pure white flowers was shown to me by Miss Prinsep, who collected it in the same locality. The flowers have been described as salmon-coloured, but I saw none approaching that hue. There is a very good figure in a recent part of Curtis' 'Botanical Magazine' (1).

The stem, leaves, flower-stalks and calyces were all thickly covered with glands, which had captured large numbers of insects, among which I observed ants, small flies and mosquitoes, and a few moths and bugs.

The glands, as Darwin pointed out (2), are of two kinds—long-stemmed and sessile. Both kinds are found in all parts of the plant above ground, except the corolla and its internal whorls.

The pedicellate glands (Pl. xxxvii., figs. 1 and 2) are about 0·018 mm. high, the stalks being slender, thin-walled, hollow and unicellular. There is in many a marked constriction or neck just where they join the head. The head is flat and circular, 0·003 to 0·005 mm. in diameter, and divided into a large number of wedge-shaped cells radiating from the centre (fig. 10). The epidermis forms a pocket of large flat cells (fig. 3) under the base of the pedicel. Darwin says of the pedicels (2):—"The walls are marked with fine intersecting spiral lines, and the pedicel often spirally rolled up." His specimen was dried. I was unable to detect the spiral lines in spirit specimens, and the pedicels were collapsed in all sorts of irregular shapes. But on examining a

dried leaf, I saw the spiral lines very plainly. When mounted in glycerine, they are still visible, but very faintly; and in spirit they disappear completely. Among the glands on a dried specimen I saw a few with very small heads, not much larger than the diameter of the stalk. These are probably young undeveloped glands. Darwin says the heads of the glands are purplish, and although I find no mention of it in my notes, I am under the impression that I noticed this in examining the plant with a hand lens. But in both dried and spirit specimens I find that the heads are colourless and transparent.

The sessile glands (figs. 4, 5 and 6) occur in rows down the stem, leaves, etc., the rows being broken every 3 to 8 by stomata, and at longer intervals by pedicellate glands (fig. 7, *pg.*). The heads are slightly flattened spheres, sometimes with a slight projection on top (fig. 5), and are crimson in colour. Each row occupies a shallow groove or channel formed by the epidermal cells on each side of the row being larger in diameter; and where a stoma or a stalked gland occurs, the channel divides and runs on each side of it. The heads are peculiarly divided into sections (fig. 6). They are 0·001 mm. in height and 0·003 mm. in diameter. Darwin observes (*loc. cit.*) that the glandular hairs are far more simple in structure than those of the other genera of Droseraceæ, and do not differ essentially from those borne by innumerable other plants. They certainly do resemble the glandular hairs found in Plumbago, Primula, and some of the Verbenaceæ. As before mentioned, both kinds of glands are found on the flower-stalk and calyx, and are, if anything, more plentiful on these than on the leaves. The plant does not in any respect resemble a Drosera, and it is not at all to be wondered at that some botanists are inclined to place it in another family (1).

The stomata (fig. 8) occur on the stems and leaves, and are 0·003 mm. long and 0·002 mm. wide, the orifice being 0·001 mm.

In the paragraph from which I have already quoted, Darwin says:—"As no instance is known of unicellular structures having any power of movement, Byblis no doubt catches insects solely by the aid of its viscid secretion. These probably sink down

besmeared with the secretion, and rest on the small sessile glands, which, if we may judge by the analogy of Drosophyllum, then pour forth their secretion and afterwards absorb the digested matter."

It is a fine illustration of the keen insight of the great naturalist that he should have been able to write so accurate a description, and form so correct a conception of the functions of the glands and their method of action from a dried specimen. There is little to add to the above. When an insect is caught by the stalked glands, these collapse under the weight, and pour out secretion; the victim rests on the sessile glands, and these add to the flow of liquid. This gradually dissolves the solvent portions of the prey, and the secretion runs down the channels in which the sessile glands are seated and is absorbed by them. The liquid flowing down the channels enables the glands which are not in contact with the insect to do a share of the absorption. After all the solvent parts have been removed, the glands cease to secrete; the indigestible parts dry up and drop off as in Drosera. I am inclined to think that the collapsed pedicels again become upright, not through any power of movement, but by becoming turgid by absorption of the secretion. I am led to this belief, first, from noticing how few of the stalks were bent down, even in the vicinity of a captured insect; and secondly, because in a leaf mounted in glycerine many stalks doubled up and lay flat or crumpled, but after a time regained their erect position.

As already mentioned, the leaves are triangular: the widest side is next to the stem. The epidermis is moderately thin, those rows of cells from which the glands emerge being small, and the eglandular epidermis between—generally in two rows of cells—large and circular in section-outline. Inside the epidermis is a layer of palisade and spongy tissue, of three or four rows of cells (fig. 11, *pt.*). The palisade tissue is looser than in ordinary leaves, and the spongy tissue closer than usual, so that it is hard to differentiate between the two layers. Just under the rows of epidermal cells which carry the glands, the palisade cells are closer together, two or three touching each row. The centre of

the leaf is occupied by a mass of large-celled pith (fig. 11, *p.*). There are five fibro-vascular bundles, one small, and one larger, in the angles of the side facing the stem, the smaller ones being on the inside of the layer; at the outer angle of the leaf is one bundle much larger than any of the others (fig. 11, *v.*). The bundles are inbedded in the pith, but have only a single row of pith cells on their external aspect, and these cells are smaller than the internal ones. Towards the base of the leaf there are more than five bundles; the leaf has a nearly circular outline there, and serial sections show the bundles widening out, so that at the axil they form an incomplete ring. In the stem, the bundles also form an incomplete ring.

I think that the leaves are really branchlets which have taken on the functions of the leaves.

References to Literature.

(1) Curtis's 'Botanical Magazine,' fig. 691, 7846.

(2) Darwin, C.—'Insectivorous Plants,' p. 343.

EXPLANATION OF PLATE XXXVII.

Byblis gigantea, Lindl.

Figs. 1-2.—Heads of pedicellate glands.

Fig. 3.—Insertion of pedicellate gland.

Fig. 4.—Sessile gland.

Fig. 5.—Sessile gland with projection on apex.

Fig. 6.—Surface view of sessile gland.

Fig. 7.—Surface view (diagrammatic) of epidermis; *pg.*, base of pedicellate gland; *st.*, stoma; *sg.*, sessile gland; *ch.*, channel.

Fig. 8.—Surface view (diagrammatic) of stoma.

Fig. 9.—Section of stoma.

Fig. 10.—Surface view of head of pedicellate gland.

Fig. 11.—Diagram of leaf section; *p.*, pith; *v.*, fibro-vascular bundles; *pt.*, palisade tissue.

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